SIX DOLLARS

A CAHNERS PUBLICATION

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE

JUNE 25, 1990

SAMSUNG
Stakes its claim on U.S. chip markets
PAGE 34

Electronics industry midyear outlook
PAGE 42

How to manage your suppliers
PAGE 51

Ilbok Lee, president of Samsung Semiconductor

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES – WORLDWIDE

VOL. 16, NO. 12 JUNE 25, 1990

Cover photograph: Christopher Springmann

PAGE 34 Samsung Semiconductor president Ilbok Lee: Trying hard to be seen as a good U.S. corporate neighbor

COVER STORY/SAMSUNG SEMICONDUCTOR

34 Samsung stakes its claim on semiconductor markets

Six years into the DRAM business, Samsung Semiconductor is coming on like gangbusters in U.S. chip markets. Its strategy is fueled by aggressive pricing — and the lofty ambition of its parent Samsung Electronics and grandparent Samsung Group — to make it to the top 10 list of world chip producers. U.S. OEMs certainly are pleased to have another big supplier, but American semiconductor competitors are casting a wary eye.

UPDATE

15 Business Trends
PC industry sees greener pastures through Windows 3.0; Computer CEOs take new stance on dumping; Big rise in Baldrige Award candidates; Competitiveness lags at U.S. electronics firms; Capital gains and the little guy; More fallout over U.S. technology stance; Standards body: If it ain't broke . . . ; Philips and Thomson banking more on HDTV; A federal matchmaker for strategic alliances; New software is goal of coalition.

25 Economic Trends
CFOs send positive signals about 1990 capital spending plans; Expert panel sees slow chip growth; Computer firms can no longer rely on foreign sales.

27 Companies to watch
Mass Microsystems gives the Macintosh multimedia capabilities; Tricord Systems offers workhorses to keep networks running; Objectivity tailors a database to engineering.

29 Letter from Silicon Valley
Robert N. Noyce: 1927 - 1990. History will record that Robert N. Noyce, the coinventor of the integrated circuit, created what is now a growing $50 billion semiconductor industry. Who can replace him?

SAMSUNG SEMICONDUCTOR

34 Samsung stakes its claim on semiconductor markets
In many respects, Samsung has been successful using the Japanese model of vertical integration. But the giant company is trying to project some key differences: more open home markets, closer attention to U.S. demands, and a corporate "good neighbor" policy through careful joint technology agreements. In the U.S., Samsung is trying hard to overcome the reticence that is the preferred style of the Asian business culture.

36 Samsung Group: South Korea's premier chaebol

38 Samsung Semiconductor's Lee brings diverse experience

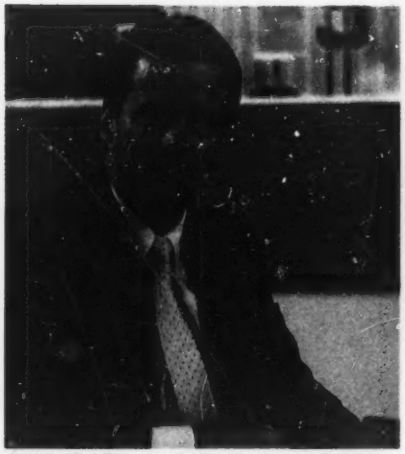
MIDYEAR OUTLOOK

42 Steady gains in '90 and '91 for the economy and electronics
Economists are generally optimistic about the economy. Most are forecasting slow but steady growth this year and a rebound next year. But they warn there are plenty of hurdles ahead including persistent inflation and high interest rates.

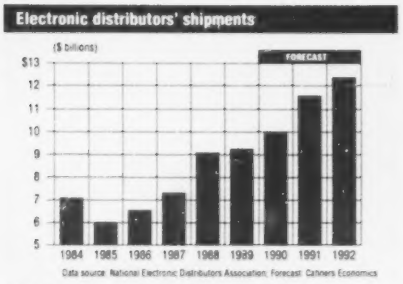
44 The ELECTRONIC BUSINESS panel of economists
An ELECTRONIC BUSINESS panel of five industry economists from Texas Instruments, Unisys, AT&T, DEC and Hewlett-Packard offer their short-term economic outlook.

MANAGING RESOURCES

51 Reward your suppliers, and they'll reward you
Increasingly, electronics companies are looking for ways to boost quality while cutting costs and design time, and increasingly they are counting on their suppliers to help them do so. Executives realize that the purchasing process adds up to more than just dollars-and-cents savings.



PAGE 15 Morgenthaler Ventures' Robert Pavey: Typical investor is no fat-cat



PAGE 101 Business Barometer

PAGE 27 Mass Microsystems' Carl Pompel

PAGE 77 Taiwan's Morris Chang: Can he turn Wyse around?

PAGE 51 CompuAdd's James Ziaja: Managing his suppliers

PAGE 58 High-tech stocks are exceeding expectations

58 High technology stocks are beginning to rise and shine

The electronics industry caught most Wall Street analysts napping early this year when stock prices rose far above the market averages. If they keep rising, seven long and lean years of underperformance could end. Not since 1983 have technology shares outpaced the mainstream market.

EUROPE BUSINESS

63 DRAM price agreement helps Japan more than Europe

European computer makers are railing against the six-month-old DRAM floor-price agreement between the European Community and 11 Japanese semiconductor manufacturers. They say the agreement lives up to their worst fears: European chip prices are being set with almost cartel-like behavior, benefiting the Japanese more than the European chip industry.

64 **GEC and Siemens complete the carve-up of Plessey**

64 **Rank Xerox targets East Bloc profits**

ASIA/PACIFIC BUSINESS

77 Morris Chang: Taiwan's emperor of electronics?

Morris Chang walked away from a successful management career in the United States to energize Taiwan's semiconductor development program. Now he's taken on an additional challenge as he moves to exploit the country's investment last year in Wyse Technology. As chairman of four vertically integrated technology concerns in Taiwan, Chang is spearheading the effort to help the island's electronics industry catch up to the rest of the world.

MARKET PERSPECTIVES

83 As processors speed up, SRAM markets accelerate

The small, and relatively secure, SRAM pond is getting swamped. Fast static RAMs, which had been the province of smaller niche-oriented semiconductor manufacturers, are being channeled out by some very large competitors. Why are these big companies entering the fray? A driving need from personal computer makers for large volumes of very fast SRAMs to work with the newest microprocessors.

91 Smaller drives aim to satisfy needs of workstation market

Workstation vendors call for high-capacity, high-performance drives; drive manufacturers are happy to comply.

BUSINESS BAROMETER

101 **Distributors**
Distributor orders and shipments surge.

102 **Components**
Component industry is looking up.

DEPARTMENTS

5 **Inside Business**
9 **Letters**
97 **My View**
Remaking a great company
98 **Advertiser index**
104 **Viewpoint**
Why you should stick to your knitting

COMPANIES IN THIS ISSUE

94 **An index of the companies covered in this issue.**

EDITORIAL STAFF

Publisher: Frank J. Burge

Editor: Jeffrey Bairstow

Managing Editors: J. William Semich, Roger C. Plant

Senior Editors: Linda Stallmann (Financial), Bruce C. P. Rayner, Rick Whiting, Barbara N. Berkman, Teri Sprackland

Assistant Editors: Peter L. Burrows, Barbara Jorgensen, Xiong Xiaoge, Giuseppe Labianca

Section Editor: Marvin V. Greene

Research Editor: Michelle D. Doses

Contributing Editors: Elizabeth Baatz (Cahners Economics), Dwight B. Davis (Boston), H. Garrett DeYoung (Boston), Madeline Franchi (Cahners Economics), Sarah Glazer (Boston), Charles L. Cohen (Tokyo), Ray Wise (New York)

Consulting Editors: Alberto Socolovsky, Allen Furst

Production Editor: Karen J. Covey

Editorial Assistant: Jean O'Brien

ART STAFF

Art Director: Michael Roach

Associate Art Director: Carla Aguilar Leeder

Staff Artist: Michele G. Kane

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, Mass. 02158
(617) 964-3030 Telex: 94 0573 CPC BSN
Fax: (617) 558-4327 MCI: EBBOS

Washington, D.C.: Pam Nazaruk
1333 F Street, N.W., Suite 720
Washington, D.C. 20004 (703) 960-4549

San Jose, Calif.: Teri Sprackland
Sherman Building, 3031 Tisch Way, Suite 100,
San Jose, Calif. 95128 (408) 296-0868

Northwest: Paula Doe
5011 133rd Place SE
Bellevue, Wash. 98006 (206) 641-0903

London: Barbara N. Berkman
27 Paul Street
London EC2A4JU England 011-44-71-628-7030
Fax: 011-44-1-628-5984

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Andrew A. Jantz

Production Manager: Betsy Harkins; (617) 964-3030

CIRCULATION

Circulation Manager: Ann Ward
44 Cook Street, Denver, Colo. 80206
(303) 388-4511

Total Circulation: 77,804

REPRINTS

ELECTRONIC BUSINESS articles are available on a custom printing basis at reasonable prices. Contact Andrea Marwitz, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., P.O. Box 5080, Des Plaines, Ill. 60018 (708) 635-8800
Electronic Business can be purchased on 35mm microfilm through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106

Getting the Samsung lowdown

Getting the lowdown on a massive family-run Asian conglomerate like the Samsung Group is no mean feat, but one that our San Jose-based senior editor Teri Sprackland has managed to do. Like the Japanese, South Korean Samsung prefers to play the "I've Got a Secret" game. The less the world knows about its strategies — and especially its balance sheet — the better.

Maybe that's the reason little has been written about Samsung. In doing a database search, Teri was amazed to discover there were no major articles about the company for her to review. In fact, an official at Samsung's U.S. subsidiary, Samsung Semiconductor, told Teri future Samsung inquirers would be referred to her article.

Teri Sprackland, San Jose senior editor

So getting inside of Samsung was a challenge in itself. As Teri explains, $40 billion Samsung is Korea's premier chaebol, making everything from ships to chips. Chaebol, she says, literally translates into financial clan — in Samsung's case powerful operating units fighting their own territorial wars around the world for the good of the clan.

Once inside, what did Teri find? A company that has a vertically integrated strategy not unlike the Japanese, while at the same time professing to be a good U.S. corporate neighbor through partnerships with the likes of IBM and HP. Samsung wants to do what the Japanese companies have done, but in less time.

The group's goal through clan-member Samsung Electronics, which owns Samsung Semiconductor, is to be one of the world's top 10 chip producers by 1995. Indeed, such a stance has U.S. and Japanese chip makers casting a wary eye. Teri's story sorts out a lot of heretofore unanswered questions about South Korea's biggest company.

Welcome aboard, Teri

Our Samsung story, and this issue, serves as Teri's baptism by fire to ELECTRONIC BUSINESS. Teri joined us recently as San Jose senior editor from CMP publications, where she also wrote about technology. Many of you already know of her journalistic work in Silicon Valley. She also has written for Knight-Ridder Financial News and Capital Cities Communication. Look for two other pieces from Teri in this issue: an overview of the SRAM market, and a "Letter from Silicon Valley." Welcome, Teri.

MARVIN GREENE, section editor

ELECTRONIC BUSINESS® (ISSN 0163-6197) is published twice a month, except monthly in December, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President; Frank Sibley, Senior Vice President/General Manager, Boston Division; Jerry D. Neth, Senior Vice President/Publishing Operations; J.J. Walsh, Senior Vice President/Finance; Thomas J. Dellamaria, Senior Vice President/Production and Manufacturing; Ralph Knupp, Vice President/Human Resources. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5800. Telephone: (303)388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. POSTMASTER: Send address corrections to ELECTRONIC BUSINESS® at the Denver address.
ELECTRONIC BUSINESS® copyright 1990 by Reed Publishing USA. Ronald G. Segel, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Senior Vice President. Annual subscription rates for non-qualified people: USA, $79.95; Canada, £ $99.95; other countries, $120 per year. $100, air mail surcharge. Except for special issues where price changes are indicated, single copies of regular issues are available for $10.00 (USA, Canada/Mexico and foreign). Please address all subscription mail to Eric Schmerer, 44 Cook Street, Denver, CO 80206-5800. Cahners Publishing Company, A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Research • Technology • Electronics • Computing • Printing • Publishing • Health Care • Foodservice • Packaging • Environmental Engineering • Manufacturing • Entertainment • Home Furnishings • Interior Design. Specialized Consumer Magazines: Child Care • Boating • Wedding Planning.

BPA ABP

Compaq's Canion: "Antidumping laws should be effective remedies for injuriously unfair pricing, no more and no less"

What computer CEOs want

Anitdumping reforms that:

1. Increase deterrence of multiple dumping;
2. Improve anticircumvention measures;
3. Revise methods for calculating production costs;
4. Recognize marketplace realities.

no less," says Compaq Computer Corp. CEO Joseph R. "Rod" Canion. Besides Compaq, the CSPP — which was organized last year to advocate public policies to boost the global competitiveness of U.S. high-technology industries — includes Apple Computer Inc., Control Data Corp., Cray Research Inc., Digital Equipment Corp., Hewlett-Packard Co., IBM, NCR Corp., Sun Microsystems Inc., Tandem Computers Inc. and Unisys Corp.

The group also calls for long-term trade policies that will open foreign markets without resorting to the principles of managed trade.

The CSPP's stance on product dumping drew a predictable reaction from the Semiconductor Industry Association (SIA) in Cupertino, Calif. While the CSPP is an effective forum for the computer industry to agree on certain issues, says SIA president Andy Procassini, he rejects the idea of suspending antidumping fines if products are in short supply.

"How will these [computer] companies react if low-cost PCs are dumped into the U.S. market?" Procassini asks. "If products are in short supply, it's unlikely that a competitor would be selling below cost." But if a shortage is the result of previous dumping by a producer that does so to control market volume and prices, he adds, there is little merit in letting the offender off the hook.

On a related matter, Procassini addressed the issue of whether start-up costs for new products should be figured into fair market value agreements. Before that can be determined, he says, further discussion is needed to define start-up volume levels. "A million PCs are not the same as a million DRAMs," he says.

PAM NAZARUK
AND TERI SPRACKLAND

QUALITY

Big rise in candidates for '90 Baldrige Award

STILL THINK THAT competing for the Malcolm Baldrige National Quality Award is a piece of cake? U.S. executives don't think so. The number of formal applications submitted this year is up more than 100% over last year — 97 companies compared with 40 in 1989.

Of the 97 companies entering — which the Department of Commerce's National Institute of Standards and Technology (NIST) will not identify — 45 are manufacturers, 18 are service companies and 34 are small businesses.

The NIST sent out over 100,000 copies of the award's application guidelines this spring.

The statistics confirm at least two common perceptions of the Baldrige. One, suggested by the increase in the number of requests for guidelines, is that U.S. firms are eager to boost the quality of their products and services, and are using the application process to spot weak points. Secondly, only a few that finish the guidelines are confident enough in their quality to enter.

— H.GARRETT DEYOUNG

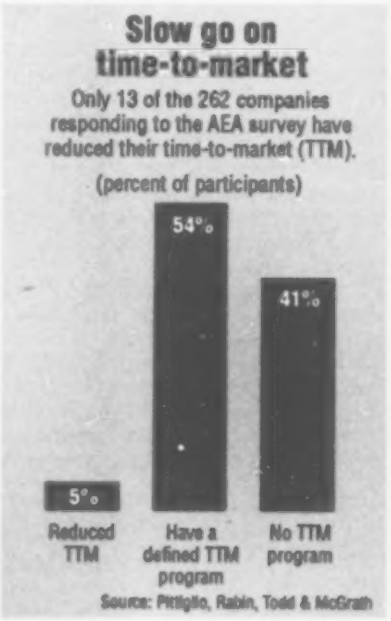
COMPETITIVENESS

Competitiveness lags at U.S. electronics firms

WHEN IT COMES to global competitiveness, few U.S. electronics companies have truly risen to the challenge. That conclusion is drawn from the results of a recent American Electronics Association productivity survey. Respondents recognize that the basis for competition is shifting toward quality and service and away from technology, but few companies have made the necessary transition, according to the survey.

"The most disturbing evidence is the lack of commitment to total quality management programs by U.S. technology companies," says Maxwell Hall, a director with Pittiglio, Rabin, Todd & McGrath in Mountain View, Calif., the consulting firm that conducted the survey for the AEA. Hall says that of the 73% of survey respondents that have some sort of quality program, only about a third have committed to a corporate-wide program.

The lack of quality programs has serious implications for improving defect rates. Survey respondents that have TQM programs have achieved a 25% improvement in defects over the last three years. That is "abys-


Slow go on time-to-market
Only 13 of the 262 companies responding to the AEA survey have reduced their time-to-market (TTM).
(percent of participants)
54%
41%
5%
Reduced TTM
Have a defined TTM program
No TTM program
Source: Pittiglio, Rabin, Todd & McGrath

mal" says Hall. A well functioning TQM program should produce a 50% to 70% improvement rate every three years.

Another problem is speed, says Jack Moore, also a PRTM director. Only 5% of the surveyed companies have improved their time to market. In total, 93% of the 262 companies surveyed rank TTM as a critical factor in their industry.

BRUCE C.P. RAYNER

CAPITAL

The capital gains issue — and the little guy

IN THE seemingly endless debate on capital gains, some lawmakers can make a pretty convincing case against cutting the taxes on those gains. Since most venture funds come from large untaxed institutions or foreign investors, opponents say, the benefits from a cut will fall to a relatively small handful of investors — too few to justify rewriting the law. Besides, they add, most investors are rich enough and don't really need any more breaks.

Morgenthaler Ventures' Pavey: Typical investor is no fat-cat

Wrong, says Robert D. Pavey, a partner with Morgenthaler Ventures in Cleveland and president of the National Venture Capital Association based in Arlington, Va. Most of the benefits of a lower capital-gains tax, he claims, would end up in the pockets of a huge number of small investors who seek long-term gains rather than dividends and interest.

Without that payoff, says Pavey, "A lot of these people will be trying to decide whether to invest their money or simply spend it. They're certainly going to become a lot more cautious." Pavey made his comments at a recent conference hosted by the American Electronics Association.

Pavey notes that untaxed institutions and foreign investors indeed generate about half of the funds committed to professional venture capital firms today. But formal venture capital altogether accounts for only about $3 billion a year in new funds, he says. Far more substantial is the role played by "informal" investors, who sock a whopping $55.6 billion a year into small-growth companies, according to a study by the Small Business Administration (SBA).

Pavey also cited the SBA study to dispel the fat-cat image of the typical informal investor: Median family income is a fairly modest $90,000, with one-third earning less than $60,000. Only one in three informal investors boasts a net worth of $1 million or more.

— H.G.D.

GOVERNMENT

More fallout over U.S. technology stance

ON THE SURFACE, the word is that the founder and director of Project Socrates, a foreign technology assessment program within the Pentagon's Defense Intelligence Agency, has resigned to start his own consulting firm. But the recent departure of Michael C. Sekora is being viewed as more fallout from the Bush administration's refusal to set an industrial policy for U.S. high technology.

Word of Sekora's resignation follows the recent removal of Craig Fields as head of the Defense Advanced Research Projects Agency (DARPA) after the agency invested $4 million in Gazelle Microcircuits Inc., gaining a direct equity position in the Santa Clara, Calif., company.

The removal of Fields, plus Sekora's resignation, may be proof that attempts to promote technology for both commercial and defense applications may be coming "under terribly severe scrutiny," says Robert B. Costello, a senior research fellow with the Hudson Institute in Indianapolis. Costello was an under secretary of defense for acquisition during the Reagan administration.

In discussing his resignation during a Washington conference on defense spending last month, Sekora explained that funding for Project Socrates runs out later this year and legislation to merge the project with the Defense Industrial Network agency had stalled. Sekora has started his own company, Technology Strategic Planning Inc. of West Palm Beach, Fla., to provide assessments of foreign technology for U.S. clients.

— R.W.

STANDARDS

Standards body: If it ain't broke . . .

A DEPARTMENT OF Commerce proposal to establish a U.S. government standards council has run into strong industry resistance. Opponents argue that the voluntary American National Standards Institute (ANSI) should remain as the nation's chief standards setting body.

The Office of Standards Services within Commerce's National Institute of Standards and Technology is proposing the Standards Council of the USA (SCUSA) concept, saying most other countries operate government-directed standards groups. Mimicking such an approach might improve the United States' position when participating in the formation of international standards, sponsors say.

Nonsense, responds ANSI and its backers. Among other achievements, says ANSI chairman, James N. Pearse, "under the current system, our country has obtained leadership positions internationally for many important technologies."

ANSI's success was recently demonstrated in an international technology standards meeting, where the U.S. position prevailed 105 out of 106 times, says John L. Pickett, president of the Computer and Business

CAPITAL SPENDING SURVEY

CFOs send positive signals about 1990 capital spending plans

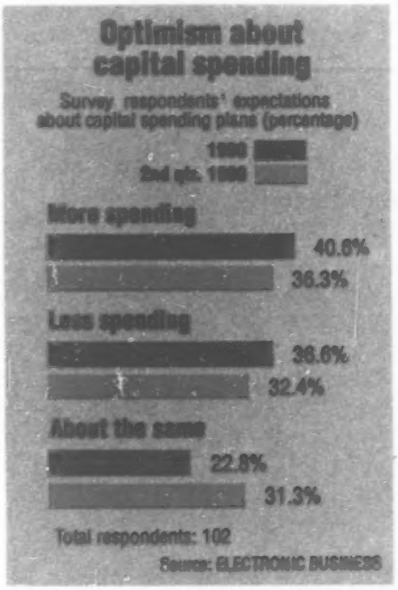
U.S. ELECTRONICS COMPANIES are optimistic, albeit slightly, about capital spending this year, according to a quarterly survey conducted by ELECTRONIC BUSINESS. The first quarter was the low point of the year, and spending is expected to pick up as 1990 progresses. The lack of any real bullishness is attributable to sluggish sales growth.

Still, only a small majority of chief financial officers are forecasting higher capital spending this year. In all, 41% of the 102 CFOs surveyed by ELECTRONIC BUSINESS expect their company's total 1990 capital spending to be above 1989 levels, compared with 37% who project lower spending. For this quarter, 36% of CFOs surveyed expect capital spending to be higher than the first quarter of 1990, while 32% expect it to be lower.

For companies with sales over $250 million, there is clearly greater pressure to raise spending levels. Capital spending will rise this quarter at 46% of the larger electronics companies surveyed, while only 23% expect it to drop.

The balance between higher and lower spending was reversed last quarter. Thirty six percent say their company's capital spending actually rose, while 39% say it declined, compared with fourth-quarter 1989.

The biggest constraint to current spending plans is poor sales growth, according to the survey. One third of the CFOs surveyed say the lack of any significant sales gains is constraining capital spending plans. Other reasons given are the high cost of capital and excess capacity.



U.S. electronics companies are spending the most on retooling their U.S. factories. In the first quarter of 1990, 56% of all that was spent went into factory capital equipment, while only 23% went into office equipment. Eighty-nine percent of total first-quarter capital spending was in the United States, with Europe accounting for only 5% and Japan 1%.

BRUCE C.P. RAYNER
WITH XIONG XIAOGE

FORECASTS

Expert panel sees slow chip growth

FORECASTS BY AN ELECTRONIC BUSINESS panel of experts point to slow chip-sales growth through much of 1990, with a strong rebound next year. The outlook for the economy is similar: slow GNP growth in 1990 with a pick up in 1991.

U.S. semiconductor sales will grow by 3% this year to $16.9 billion and by 14.4% next year to $19.3 billion. Worldwide sales will post a 5% growth rate this year to $56.9 billion and a 15.4% growth rate in 1991 to $65.7 billion. U.S. GNP growth will be 2.1% this year and 2.8% next year. The forecast is based on projections from nine leading industry analysts.

The panel was also asked to comment on the most critical problem facing U.S. semiconductor producers over the next 12 months. The responses hit on the need for better inventory control, Japan's lead in 4-megabit DRAMs, sagging profits, a production glut and the high cost of capital.

Something to watch, says panel member Ed Henderson, president of Henderson Ventures, is the threat of double ordering during late 1990. Because inventories are at record lows, semiconductor supplies will be tight, tempting OEMs to increase their safety stocks.

—B.R.

COMPUTERS

Computer firms can't rely on foreign sales

THE 20 LARGEST U.S. computer manufacturers sold more products overseas than they did domestically in 1989, but the growth rate slowed dramatically, according to a study by Gartner Group Inc., a Stamford, Conn., market research firm. The slowdown serves as a red flag for many electronics companies that have come to depend on growth in foreign sales to offset sluggish U.S. sales growth.

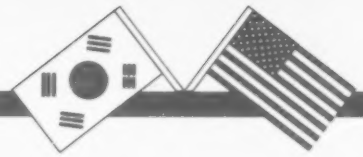
The top 20 computer companies account for 70% of all U.S.-produced hardware, software and services.

Sales abroad for the 20 largest domestic computer makers accounted for 50.1% of worldwide revenue in 1989, up from 48.4% the previous year and 45.5% in 1987, states Gartner Group's "Yardstick Top 100 U.S." report. Overall, foreign sales grew by 10.8% in 1989 down from 19.1% in 1988. Randall Brophy, a Gartner Group analyst, attributes part of that statistical slowdown to changes in currency exchange rates.

Growth in foreign sales in 1989 still outpaced domestic sales growth by the top 20 U.S. computer makers. Domestic sales increased only 3.5% in 1989, down from a 5.9% growth rate in 1988 and a 5.8% growth rate in 1987.

The top 20 U.S. computer manufacturers saw growth in European sales slip to 9.5% last year from 1988's 17% growth. That is the first time since 1982 that statistic has fallen to single digits. Even the rapidly expanding Asian market is losing its luster. The top 20 saw Asian sales growth slow to 12.7%, down from 25.1% in the previous year.

RICK WHITING



Samsung stakes its claim on semiconductor markets

Following the trail blazed by the Japanese, South Korea's biggest company is fighting for a place among the world's top 10 semiconductor companies

BY TERI SPRACKLAND

Six years into the dynamic RAM business, Samsung Semiconductor Inc. is coming on like gangbusters in U.S. chip markets. With a strategy fueled by aggressively priced DRAM sales, Samsung is determined to make it to the top 10 list of world semiconductor companies.

U.S. OEMs certainly are enthusiastic about having another supplier, but semiconductor competitors are watching warily.

Starting from a U.S. base of volume DRAM sales to customers hungry for more chips, the U.S. subsidiary of South Korea's Samsung Electronics Co. Ltd., is zooming in to tighten its hold. Samsung has used low DRAM prices to get the attention of U.S. buyers — and succeeded. Its key customers include top OEMs such as Tandy Corp. and Apple Computer Inc.

And the San Jose-based subsidiary is fast approaching its goal of $1 billion a year in sales before 1995. It started with sales of only $12 million in 1984. Samsung Semiconductor's U.S. DRAM sales in 1989 approached $400 million and projections are for 1990 sales to top $600 million, says Joel Girsky, chairman and CEO of Samsung's largest U.S. distributor, Jaco Electronics Inc. of Hauppauge, N.Y. Samsung Electronics, owned by the tightly-held, family-run conglomerate Samsung Group, does not release financial information on its subsidiaries, including Samsung Semiconductor.

Ilbok Lee, Samsung Semiconductor president, says his key strategy for the U.S. market includes broadening Samsung's product portfolio to further boost profitability. From inception of product development, Samsung emphasizes both globalization and localization, he adds.

Samsung Semiconductor operates a design and pilot production plant in San Jose, and acts as window into the U.S. market with more than 450 employees, 100 of which are engineers. Of that staff, only about 15 are Koreans. The subsidiary handles product development and licensing, marketing and sales, and the sourcing of materials from U.S. suppliers, including purchases of chemicals, gas and equipment, for use in Korea.

Total U.S. investment to date has been about $70 million. The 10,000-square-foot San Jose fabrication facility is a Class 1 CMOS line, with formative work being done on programmable logic, special analog to digital converters, smart power devices, first-in-first-out (FIFO) devices, microprocessor peripherals and ASIC memory.

By 1995, Lee expects Samsung Electronics to be on the top 10 list of worldwide semiconductor suppliers. According to market research firm Integrated Circuit Engineering Corp. (ICE), Scottsdale, Ariz., Samsung Electronics totaled worldwide chip sales of $1.4 billion in 1989, up from $940 million the previous year. Some reports put its operating profits at $165 million in 1989, up from 1988's $90 million. In 1989, market research firm Dataquest Inc. ranked Samsung 13th among the world's semiconductor companies.

But volume DRAM sales alone won't be enough to propel Samsung to a position among the world's elite. So Samsung must also quickly gain market recognition as both a quality supplier and one that can provide one-stop shopping beyond DRAMs, without provoking insurmountable trade frictions. Samsung has already taken some heat on intellectual property violations. The International Trade Commission found in 1987 that Samsung had violated Texas Instruments Inc.'s DRAM patents. In April, Samsung settled out of court with Advanced Micro Devices Inc. over programmable logic patents.

In many respects, Samsung has been successful using the Japanese model of vertical integration. But the company is trying to project some key differences: more open home markets, closer attention to U.S. demands, and a corporate "good neighbor" policy through careful joint technology agreements. In the United States, Samsung is making an effort to overcome the reticence that is the preferred style of the Asian business culture.

W. Keith McDonald, Samsung Semiconductor vice president of marketing and sales for commodity memory and formerly director of sales for Toshiba Corp.'s U.S. semiconductor operations, can compare from personal experience the differing styles of a Japanese and a Korean company. He notes the willingness of the Korean decision makers to say yes; to say yes with qualifications clearly explained, or to say no, and here's the reason why.

Sensitive to suspicions that it cop-

ied its strategy from the rulebooks written by its Japanese predecessors, Samsung professes itself eager to be a good U.S. corporate citizen. As Lee emphasizes, "Samsung wishes to make a meaningful contribution as a corporate citizen in Silicon Valley, to be harmonized within the local community."

Samsung points with pride to its acceptance among the ranks of the majors, as demonstrated by technology agreements and exchanges with the likes of IBM for a mutual semiconductor patent swap, NCR Corp. for ASIC technology in exchange for static RAM technology, and Intergraph Corp. and Hewlett-Packard Co. for RISC microprocessors.

Brian Matas, market research analyst with ICE, characterizes the technology swap with IBM as a buffer maneuver by the U.S. giant against the Japanese. "IBM doesn't want anything to do with the Japanese, and are looking for anything they can do to boost themselves against the Japanese," Matas says. "IBM is hooking up with a good technology that is not based in Japan."

Thus, in the world of mission-critical DRAM chips, customers are enthusiastic about having another supplier and seem willing to work with Samsung as it diversifies and improves quality. "We've been involved in buying DRAMs from Samsung for several years, and now have a good working relationship," says John Patterson, Tandy senior vice president. "They are making continuing progress in areas such as quality, pricing and availability."

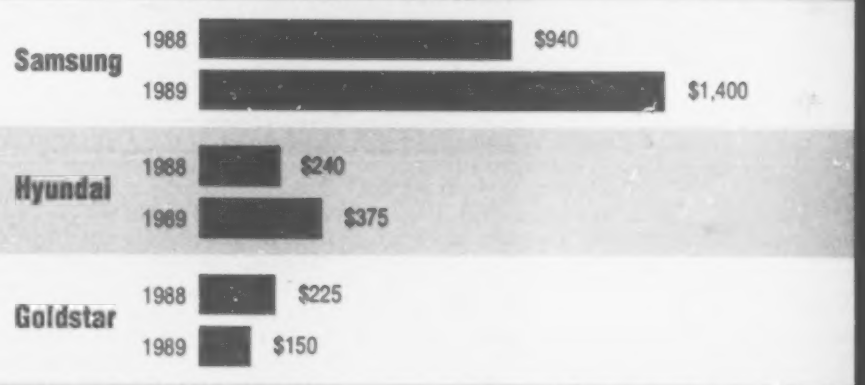
Patterson discounts widespread claims that Samsung precipitated a price war in DRAMs during the past year, saying price pressures were following the same competitive cycle seen for years in the semiconductor industry. "It's a highly competitive, capital-intensive industry," Patterson notes. "It was the same when there were only American companies involved. We don't look at what country a supplier is from."

Samsung has been pouring time, money and energy into its several technology partnerships at once. An alliance with Intel Corp. has Intel reselling Samsung DRAMs. The deals

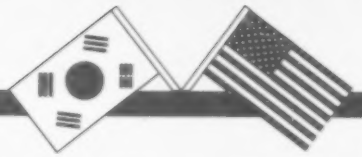
Ilbok Lee, Samsung Semiconductor president: Eager to be viewed as a good U.S. corporate neighbor

Samsung moves out front

Worldwide semiconductor sales by Korea's largest electronics companies ($ millions)



Source: Integrated Circuit Engineering Corp.



with HP and Intergraph round out Samsung's RISC microprocessor expertise, and still another joint arrangement with Zilog Inc. is filling its weakness in its microcontroller offerings. The June 1989 Zilog deal allows Samsung to manufacture and market Zilog's Super-8 microcontrollers for use in consumer electronics items such as VCRs.

Sharam Shirazi, Zilog's director of corporate development, says his company is awaiting the results of last year's decision to license the 8-bit microcontroller to Samsung. "We wanted Samsung's help in promoting the Super-8 architecture in the Far East," he says. "Our superintegration strategy is to get a lot of design wins with consumer parts. Samsung has a good name, a credible name." Shirazi adds that the first products from the agreement should be available this year.

Cracking distributor channels

In the United States, Samsung has been stymied by U.S. semiconductor companies in its attempt to crack distributor sales channels. Samsung failed two years ago to set up an agreement with major U.S. distributor Arrow Electronics Inc. Shortly after Arrow announced it would carry Samsung products, the distributor had to reconsider its stance when U.S. chip makers closed ranks and threatened to pull product from Arrow's shelves.

But the time is coming when a major U.S. distributor will carry Samsung's products, claims Michael G. Furman, Samsung Semiconductor director of distributor sales. "It's only a matter of who will decide to come to the window first," says Furman.

Hee Soon Sul, executive vice president of marketing and sales, adds that Samsung is already breaking down some of the walls that impede distributor sales. "Sales through the distribution channel have grown significantly since we opened our doors in the U.S. in 1984," Sul says, "and now account for more than a third of our total semiconductor sales."

Sul, Samsung's chief U.S. sales and marketing strategist, reports directly to president Lee and is responsible

Samsung Group: South Korea's premier chaebol

It's huge — about $40 billion in annual sales last year. With 159 branch offices in 46 countries for 23 principal companies, the conglomerate does business in electronics, industrial, food processing and textiles, information systems and economic development, trade, aerospace and precision instruments, and service and retail. By 1987, it grossed about one-fifth of the entire GNP of its home country. It runs its own university and has more than 150,000 employees. It makes everything from ships to chips; and in electronics alone, its capital spending is comparable to that of Japan's Toshiba Corp.

Yet the South Korean conglomerate Samsung Group is not yet a household name. As a tightly held corporation based in a country that forbids foreign investment in its stock market, even Samsung's annual sales and profits are treated as company secrets.

But as Samsung's subsidiaries mature in markets around the world, the secret is getting out — Samsung is a formidable rival.

It hasn't been easy. Samsung, as South Korea's premier chaebol — which literally translates as "financial clan" — epitomizes the small country's struggle to become a world-class economic force capable of taking on the Japanese and the Americans.

What is a Korean chaebol? Think of it as a corporation set up like a Scottish clan, with everyone sharing the same clan name and owing allegiance to the chief, but each with his own territorial war to fight. That's a fairly close analogy to Samsung Group's various subsidiaries. Next up the line from Samsung Semiconductor Inc. is Samsung Electronics Co. Ltd., which has grown on its success providing private-label TVs, VCRs and microwaves, but now sells under its own name.

Samsung Electronics reportedly increased sales 32% between 1988 and 1989, outstripping its domestic rivals Goldstar Co. Ltd, and Daewoo Electronics Co. Ltd. by a healthy margin, according to market research firm Dataquest Inc. Another vertical-integration outlet for Samsung chips in the United States is clan-member Samsung Information Systems America, which recently started moving aggressively in the U.S. personal computer market.

Samsung and all its clans have engineered a relentless frontal assault on world markets with a mixture of unremitting work, reinvestment of capital from one industry into another, and a determination that bulldozes through anything in its path. Samsung wants to succeed as a vertically integrated company just as the Japanese have done, but in a fraction of the development time.

According to Dataquest, Samsung's capital spending level reached about $600 million in 1989. The Samsung Group would already have reached 15th on the Forbes 500 list in 1987 if it were an American company.

The group is headed by Kun-Hee Lee who is the third son of founder Byung-Chull Lee. Kun-Hee took over Samsung in 1987 amid some family skirmishing after the death of the founding patriarch. As the third son, Kun-Hee was a dark horse who only was able to take over the company after his father disqualified the eldest son as incompetent and the No. 2 son went to jail in an embarrassing financial scandal.

The family-run Samsung chaebol remains tightly held, as it has been since its founding in 1938 as a general trading store. Samsung Group owns Samsung Electronics, which owns Samsung Semiconductor.

In 1987, the group's revenue was $22 billion. The next year revenue jumped to $32 billion. (No earnings estimates were available.) In 1989 revenue hit an estimated $40 billion, with earnings at $233 million.

Samsung Electronics, according to its 1988 annual report, posted $3.4 billion in net sales in 1987, with $50.4 million net income. In 1988, sales were $4.4 billion with net income at $148.8 million. □

for communication between U.S. and Korean factories. Reporting to Sul are McDonald and Joseph P. O'Neill, formerly vice president of sales at Gould AMI, who has responsibility as vice president of marketing and sales for microproducts, such as video, cache and tag RAMs, masked ROMs and FIFOs.

In February, Samsung caused a stir when it eliminated a commonly used sales approach known as ship-and-debits, which offer price protection to distributors by allowing them credit for unsold product. Instead, a commodity buying program was put in place, which reduces part cost and paperwork but leaves distributors holding the bag if prices drop. After the move to the commodity buying program, several distributors left Samsung, which now has about two dozen regional distributors.

"Samsung is sitting on the verge of becoming one of top principals in the world," contends Jaco's Girsky. "We're waiting for them to kick it over the edge." Girsky adds that Samsung has been inhibited so far because its U.S. marketing infrastructure hasn't kept up with growth. "It's been both a cultural and business learning experience for us in the last three years," according to the distributor. "Their culture goes very deep."

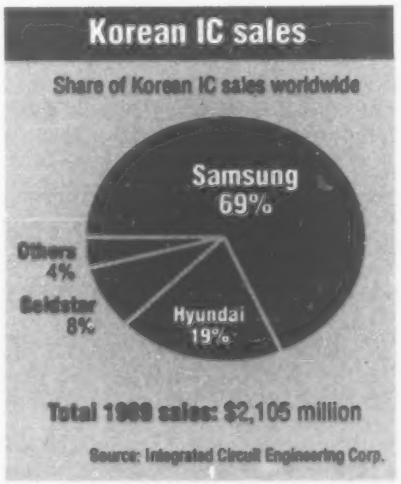
Girsky says he hopes Samsung reconsiders its commodity program, perhaps after some accounting reorganization, adding that non-DRAM sales are harder for distributors to manage through a commodity pricing system. Traditional distribution, he says, likes to maintain a large inventory to service the customer. "If we're not carrying inventory, we can't perform our major function," Girsky says. "But the reduction of paperflow is an enormous advantage."

DRAM rocket ship

Jaco has an all-location franchise with Samsung, something it sacrificed its relationship with Hitachi Ltd. and Fujitsu Ltd. to get. Girsky projects that if Samsung sales do reach $1 billion in five years, and about 20% of sales go through distribution, the value of distribution sales will be $300 million. Jaco holds about one-third of Samsung's distribution business now, he says, and "we're riding this rocket ship."

Although some, including Tandy's Patterson, do not believe that Samsung actually precipitated a DRAM price war last summer, Samsung certainly seems to have participated. According to Girsky, DRAM prices dropped at a rate of about 50 cents to $1 a month per device from about $15 last June to about $6.50 in April. Samsung went to market with a price tag about $2 below previous levels, a tactic used by semiconductor companies to gain market share.

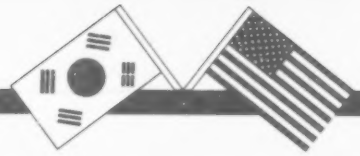
W. Keith McDonald, vice president of marketing and sales for commodity memory, left, and Joseph P. O'Neill, vice president of marketing and sales for microproducts: Learning the culture of a Korean company



Korean companies are not participants in the fair market value system set up by the U.S.-Japan semiconductor trade agreement to prevent dumping by imposing a minimum floor price. But the current cost to the Japanese for 1-Mb production is about $5, so pricing was well above fair market value (FMV) last year, and remains so, Girsky notes. Indeed, Samsung was not the lowest cost supplier in the DRAM market, he adds.

In January, prices on 1-Mb DRAMs dropped as low as $7, causing a market realignment as Japanese companies reduced production capacity. Japanese manufacturers are vulnerable if they overcompensate in reducing 1-Mb volume and thus push their own FMVs higher. The massive investments in capacity coming on-stream from the various newly industrializing Asian countries are forcing a massive confrontation for market share in commodity products.

Although Japan has controlled the lion's share of the 1-Mb DRAM supplies, all bets are off in the race for market share in the 4-Mb arena. The battle is sure to be bitter at this level, with the Japanese fighting to keep top market share. About half of the capacity of Samsung's flagship Kiheung fab in Korea will be dedicated to 4-



Samsung Semiconductor's Lee brings diverse experience

For a small country with few natural resources to rebuild a war-ravaged economy, South Korea is nearly bursting with hard-earned pride in its achievements. The classic strength of an eager, hard-working, and increasingly well-educated work force, as well as close cooperation between government and industry, are obvious key elements.

Yet one major difference between South Korea and Japan resides in the diversified experience of its expatriate community: Many Koreans working within the Korean chaebols returned after years spent all over the world in pursuit of educational and professional opportunities not available 20 years ago. They bring with them an immersion in other cultures not common among the Japanese.

Among those who returned to the fold is Samsung Semiconductor Inc. president Ilbok Lee, who joined the company in 1984. A native of South Korea, Lee received a Ph.D. in electrical engineering from the University of Minnesota in 1974, beginning his career as an engineer for Intel Corp.

Lee took over Samsung Semiconductor last August from longtime associate S. Joon Lee in a reorganization by parent Samsung Electronics Co. Ltd. The reshuffling shifted emphasis to a U.S. sales department split between commodity and microproduct groups, decentralizing design, manufacturing, sales and marketing.

Lee says one of his greatest challenges at Samsung Semiconductor is to develop a corporate culture locally that is consistent with that of the multinational parent. "In the 1990s, we're changing our original approach from quantity to quality," he says. "We have good quality products now, but we see quality as a function of service through the infrastructure of the organization."

Well aware of the increasing hostility between the U.S. and Japan over semiconductor trade issues, Lee defines his company's role as simply offering a more diversified supplier base.

"I hope we can serve as a neutralizing effect in trade tensions. Competition is healthy for the customer," Lee says. "Yet cooperative agreements are also needed. No company is strong enough to serve all technical needs — there has to be cooperation." □

Mb production, with a 6-inch, 4-Mb DRAM line on line last year.

And beyond that, Samsung is participating with the other major Korean manufacturers in researching 16-Mb and beyond technology. Sampling of Korean-made 16-Mb chips is expected by 1993.

About $100 million has been invested in a collaborative 4-Mb DRAM project between 1986 and 1989 by Samsung and other Korean manufacturers. About $300 million will be invested in the 16- and 64-Mb DRAM development by 1993, according to Dataquest. According to Korean news reports, Samsung will spend more than $850 million on research and development in 1990.

In March the company sought about $75 million in bonds, $55 million of which was to be used to expand the semiconductor operations, according to Jang-Yeul Koo, Samsung Group general manager for corporate planning. However, the bond issue has been delayed because of weak stock market conditions. Direct foreign investment in the Korean stock market cannot start until 1992.

In the 1990s, Samsung plans to diversify its product base beyond the commodity-product orientation and over-reliance on memories in the 1980s, according to a presentation made in April by S.R. Yoo, executive director of Samsung Electronics, at the Beijing Dataquest conference. The strategy will implement a transition from quantitative to qualitative growth, with increased emphasis on R&D, higher value-added products, service and quality.

A tightrope walk

ICE's Matas says Samsung needs to walk a tightrope between grabbing market share and dumping. "American semiconductor companies are looking at another player out there bashing prices," he says. "The Koreans saw how the Japanese did it and are trying to duplicate it without getting caught, or without the same consequences." Matas adds that Samsung has lots of cash to pump into R&D because it is emulating Japanese vertical integration, taking profits from shipbuilding, automobile and mining operations to support semiconductors.

Although turnabout may seem fair play to some watching Japanese semiconductor companies struggling to maintain prices against aggressive newcomers, U.S. semiconductor companies such as Texas Instruments Inc. and Micron Technology Inc. that remain in the DRAM market are also under tremendous pressure.

"We're monitoring the situation," says an official at Micron. "We would prefer that Korean companies be included in the (U.S.-Japan) trade agreement." Key provisions would be to abide by anti-dumping regulations both in the United States and in other countries, and to open Korean markets to U.S. sales. "The Korean markets are very close to being as closed as the Japanese. There's a 20% tariff on imports," the official notes.

According to the Korean Electronics Industry Association, Texas Instruments is also said to be investigating DRAM dumping by Korean companies.

Samsung's growing importance in the global electronics market is undoubtedly challenging its competitors to run their fastest races. After all, for Samsung to get to that spot on the top 10 list, somebody is going to have to get pushed off. If Samsung can continue to perfect its formula for fine-tuning its products and marketing approaches to its various markets around the world, it will be a tough company to beat.

"The Koreans are trying to accomplish in five years, what it took the Japanese 20 years to do — become a force to be reckoned with," ICE's Matas says. "They're going gangbusters, that's for sure. The Japanese are looking over their shoulders to make sure Samsung is not stealing market share." □

DRAM price agreement helps Japan more than Europe

The accord was intended to boost an infant European semiconductor industry, but the reverse has happened as Japanese chip makers flock to the continent

BY LINDA BERNIER

European computer makers are railing against the six-month old dynamic RAM floor-price agreement between the European Community and 11 Japanese semiconductor manufacturers.

The chip-purchasing equipment makers say the agreement lives up to their worst fears: European semiconductor prices are being set with almost cartel-like behavior, benefiting the Japanese producers more than the nascent European chip industry the agreement was designed to foster. Now, DRAM prices from all Japanese suppliers are within 2% to 3% of each other, much like a cartel, they charge.

European chip prices are higher than they would have been without the floor-price agreement, they allege. This profit boost is encouraging Japanese chip makers to invest heavily in Europe, they say, putting European electronics manufacturers at a competitive disadvantage to Asian producers who can purchase chips more cheaply.

"The agreement might help the European semiconductor industry in the short-term," says Georges Grunberg, director of European cooperation and long-range planning at French computer maker Bull SA, "but in the medium-term it reinforces Japanese industry, allowing them to invest hundreds of millions of dollars in Europe. We will be faced with the Japanese on our own terrain."

In January, following a three-year dumping investigation, the European Commission and 11 Japanese chip makers agreed to set a minimum price for imports of DRAMs from Japan. The floor price, revised quarterly, is based on the average cost of production plus a 9.5% profit margin.

Price cutting

The floor-price agreement is designed to protect the infant European DRAM industry from the ravages of Japanese industrial targeting. The European Commission probe found that during the dumping period Japanese companies were selling between 8.5% and 206% below usual delivered DRAM market prices. This price-cutting allowed the Japanese to increase their European market share from 24.6% in 1983 to a 70.5% in 1987.

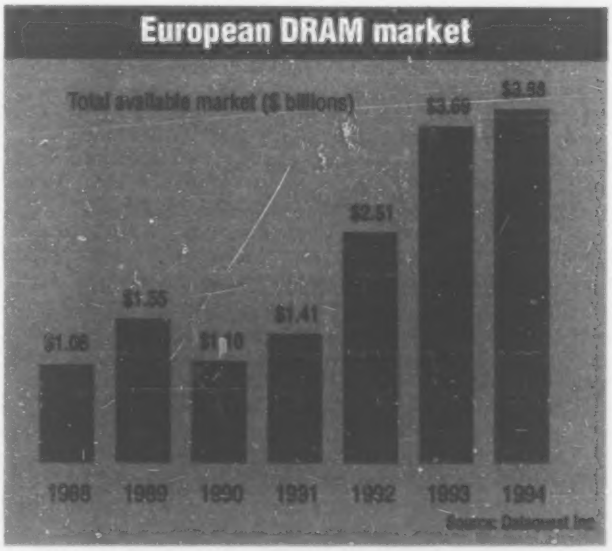
The agreement covers over a five-year period both existing DRAMs and new generation products such as 4-megabit DRAMs. It was signed by Fujitsu Ltd., NEC, Hitachi Ltd., Mitsubishi Corp., Toshiba Corp., Matsushita Electric Industrial Co. Ltd., Sanyo Electric Co. Ltd., Sharp Corp., NMB Semiconductor Ltd., Oki Electric Industries Co. Ltd., and the Japanese unit of Texas Instruments Inc.

The European Association of Manufacturers of Business Machines and Information Technology (EUROBIT) has complained to the European Commission that DRAM pricing is far less competitive than in the past.

There are also complaints about the agreement's quarterly revised exchange rate fixing. Because the yen depreciated in early 1990, companies that purchased DRAMs in local European currencies were at a big disadvantage. With the currency fluctuations, "Now we have to worry about new financial aspects in addition to commercial and technical problems," says Bull's Grunberg.

Even European chip makers who lobbied for the accord and still support it — including SGS-Thomson Microelectronics and Siemens AG — agree that it came too late. The Japanese long ago stopped dumping in Europe and started investing. Only NEC was producing DRAMs in Europe when the controversy started, but now Hitachi, Mitsubishi, Fujitsu and Texas Instruments, which produces some of its European-bound chips in Japan, announced fab investments in Europe.

With those investments, overcapacity in Europe is likely, and prices should drop. "The whole question of the price agreement with the Japanese may become



useless," says an executive at a major U.S. computer maker operating in Europe.

European chip makers also worry that the agreement may be invalidated in 1991 when the U.S.-Japanese voluntary restraint agreement on chip imports expires. If the United States chooses not to renew, U.S. chip prices would probably fall, putting pressure on European chip prices, explains Eckhard Runge, secretary general of the Brussels-based European Electronic Component Manufacturers Association (EECA).

Still, the agreement is serving its purpose. The decision by Siemens and SGS-Thomson to invest in DRAMs was encouraged by the protective policy, according to one official. "It also establishes a safety net against the re-occurrence of dumping."

What both U.S. and European chip makers really would like are more permanent measures to deal with their trading problems. EECA and the Semiconductor Industry Association are lobbying to reform the GATT's anti-dumping code so that measures are speeded and toughened up. □

MERGERS & ACQUISITIONS

GEC and Siemens complete the carve-up of Plessey

A WORD TO THOSE who lost track of the long saga of the demise of The Plessey Co.: The spoils of war were finally allotted in the 1988 $3.2 billion acquisition by Siemens AG and the British General Electric Co.

GEC has ended up with most of Plessey's businesses. Siemens won a plum 40% stake in the money-making telecommunications unit, GPT, but waived rights to Plessey Semiconductors. GPT, Britain's only manufacturer of digital telephone exchanges, will be jointly held by both Siemens and GEC, as will some minor international operations. Three businesses will be sold, including the Hoskyns Group, a leading British software company in which Plessey had a majority stake.

Strategically, the takeover let Siemens pump up its weak British market share and emerge with stronger defense operations. It got full ownership of Plessey's radar and defense systems businesses, as well as Plessey Controls, complementing its global traffic control interests.

GEC takes control of Plessey's anti-submarine warfare units, naval and avionics systems. The latter supplies precision components to Boeing Co. and other U.S. aircraft makers.

In the United States, GEC now owns Plessey's Aero Precision Corp., Dynamics Corp., Electronic Systems Corp., Materials Corp. and Sippican Inc.

Known as a poor steward of innovative technology — particularly in semiconductors — GEC now has possession of two premier research operations in Britain: Plessey's corporate R&D body and Plessey Semiconductors.

Outsiders guess that GEC will not feed Plessey Semiconductors the cash it needs to remain technology-driven. GEC chairman Lord Weinstock long has been criticized for being a tight-fisted accountant with only a passing regard for engineering.

With consolidation, key technology talents already have left. Gone since March are Melvyn Larkin, former director of technology and deputy chairman of Plessey Semiconductors. Larkin was also Britain's representative on Jessi's technology board. Keith Warren, head of Plessey Research and Technology, also departed. Overall, about 100 high-level managers left Plessey since the takeover.

Plessey Semiconductors was the only major remaining British-owned chip company, specializing in custom ICs and telecommunications ICs. GEC is blending it with its own chip unit Marconi Electronic Devices Ltd. Leading the operation since last month is Maurice Dixson, a no-nonsense executive and former managing director of the commercial aircraft division of British Aerospace plc. Streamlining in areas such as military chips is expected.

BARBARA N. BERKMAN

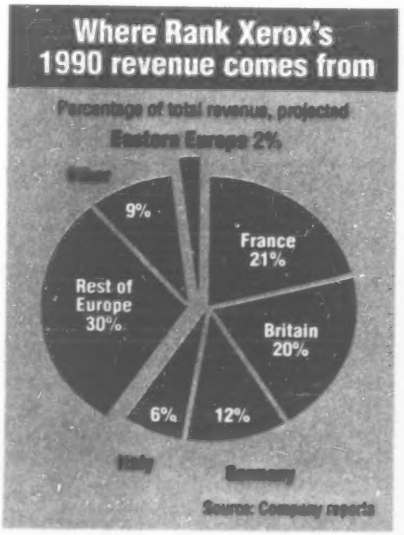
EASTERN EUROPE

Rank Xerox targets East Bloc profits

ONE OF THE MANY frustrating aspects of doing business with the Eastern Bloc has been the paucity of facilities for copying documents. Now, with Soviet restrictions on access to copying machines liberalized, Rank Xerox Ltd. is investing about $18 million over the next two years in Eastern Europe and the Soviet Union.

Rank Xerox, jointly owned by Xerox Corp. and Britain's Rank Organization, had 1989 revenue of about $82 million from the region. Rank Xerox ambitiously predicts a 300% increase in Eastern Bloc and Soviet business by mid-decade.

By 1995, Rank Xerox chairman David Thompson projects the company will earn $328 million in revenue from a copying machine market in which he estimates at more than $800 million.



The company assembles products in five Eastern Bloc countries, and last year opened its first joint-venture copy shop in Moscow. It now plans to broaden regional coverage of Eastern Europe by appointing local distributors and dealers in joint ventures. Xerox has ruled out manufacturing in Eastern Europe.

— B.B.

As processors speed up, SRAM markets accelerate

Niche players in the high-speed SRAM market can't count on price protection anymore. Demand is rising fast and attracting some very big competitors

BY TERI SPRACKLAND

The small, and relatively secure, SRAM pond is getting swamped. Fast static RAMs, which had been the province of niche-oriented smaller semiconductor manufacturers, are being channeled out by some very large competitors.

Behind this change is a driving need from personal computer makers for large volumes of very fast SRAMs to work with the newest microprocessors. Cache RAMs are gaining in popularity as a means of keeping those 33-megahertz microprocessors running at optimal speed. Soon, the next generation of 50-megahertz microprocessors will be demanding even more speed out of the memory components.

So the small, happy world of the niche players is fading fast. "SRAMs are a market that is growing, especially fast SRAMs of 35 nanoseconds and under. That market is taking hold because of cache memory requirements of new microprocessors. SRAM development is responding," says Brian Matas, market research analyst, Integrated Circuit Engineering Corp., Scottsdale, Ariz.

In 1987, the worldwide SRAM market was $1.1 billion; it almost doubled the next year to $2 billion. In 1989, it jumped again to $2.95 billion, with $3.125 billion in sales projected for this year.

Although the rate of change is expected to moderate somewhat as the decade progresses, by 1994 worldwide SRAM sales will rise to $5.1 billion, according to ICE.

The fast SRAMs, 35 nanoseconds and below, represent an increasingly large part of total sales. In 1987, only 14% of the market was for the speediest SRAMs. Last year, that increased to 19%, with 23% projected by ICE this year. Next year, the amount will increase to 27%, rising to a 40% share by 1994.

Geographically, the SRAM market in 1989 was split: 45% in Japan, 33% in North America, 13% in Europe, and 9% in the Asia/Pacific region, according to ICE. The Asia/Pacific region doubled its market share over the previous year.

Although such Japanese companies as Fujitsu Ltd., Hitachi Ltd. and NEC are the overall memory leaders in SRAMs, their offerings have tended to be in the slower speed SRAMs. In the fast lane, three American companies have held the spotlight: Integrated Device Technology Inc. (IDT), Performance Semiconductor Corp. and Cypress Semiconductor Corp. Until last year.

Last year, the larger U.S. and Asian companies moved aggressively to increase volume, and thus pushed prices down the commodity curve, both for the fast SRAMs and cache memories. Last summer, Motorola Inc. took the leap into SRAMs. Intel Corp., which once swore off memory chips as commodity items, fell off the wagon and is now working with IDT in cache development. Basically, it has become evident that companies with a significant microprocessor business can benefit from developing their own cache RAM technology. Thus the new lust for SRAM projects.

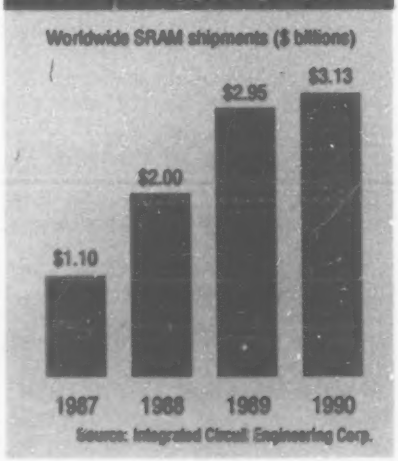
Additionally, Micron Technology Inc. has expanded its influence in SRAMs, which it entered to counterbalance DRAM price fluctuations.

On the lookout for higher returns, Japanese manufacturers are also moving into the faster SRAMs from the commodity-priced slower speed SRAMs. Japanese manufacturers are looking for avenues to increase revenue on memory lines over that available in DRAMs. In South Korea, Samsung Electronics Co. Ltd., the largest of the Korean chip makers and a major force in the 1-megabit DRAM market, is aggressively pursuing SRAM development.

SRAM makers are working on three projects: extending density from 256K to 1 Mb; pushing the speed to 10 nanoseconds, and creating specialized SRAMs.

The 256K market is going through an exponential growth phase this year because the price per bit is the same as that of 64K parts, according to Cypress' SRAM product marketing manager Stewart Sando. "By 1992, the largest volume of parts will be 256K," he says.

SRAMs: Big enough for the biggest players



Heading for 12 nanoseconds

The highest density available is now 1 Mb. Newcomer Paradigm Technology Inc. of San Jose is raising the stakes with a 25 nanosecond speed offering in 1 Mb. Paradigm president Terry Holdt sees single-cycle RISC microprocessor development demanding that memory chips

minimize wait states. "The performance of the SRAM must match the CPU," he says. "You've got to have 12 to 15 nanosecond access for a 20 megahertz RISC CPU."

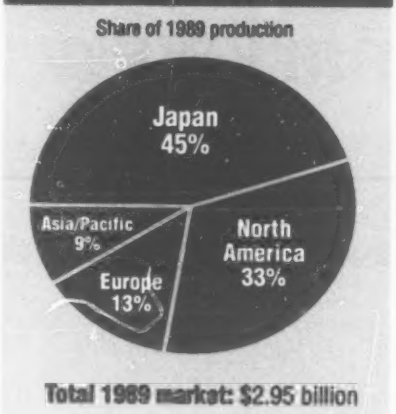
"With 33 megahertz computers now on desks, the cycle time is 20 nanoseconds," says David C. Ford, director of marketing, Aspen Semiconductor Corp. in San Jose. Thus, designers are forced to maximize speed savings at every possible opportunity.

SRAM makers are hitching their stars to individual microprocessor families, hoping to get their chips designed-in. IDT is working with Intel and Mips Computer Systems Inc. Cypress is hitched to Sun Microsystems Inc.'s scalable processor architecture design. "The market is clearly exploding," Holdt says. "The smart players will get very close to microprocessor designers."

There is a technology shift occurring in concert with the widening of the market — from CMOS to bipolar CMOS (BiCMOS). The pressure to save precious nanoseconds in the microprocessor cycle is encouraging development of BiCMOS, a technology which couples some of the speed benefits of bipolar technology with CMOS low power consumption.

Although BiCMOS was only beginning to gain some respectability two years ago, it is now gaining converts.

Guess who's leading in SRAM sales



In 1989, only 2% of the SRAMs sold in the world were BiCMOS. By 1994, ICE projects that one-fourth of all SRAMs sold will be BiCMOS. As the new technology comes onstream, older bipolar technology is fading from a 23% share in 1987 to a projected 1% by 1994, according to ICE.

"In five years, BiCMOS will be the technology of choice," predicts Ford. "It's a more complex process, but you get higher performance devices. It's the same development pattern as we went through from NMOS to CMOS. BiCMOS is next."

Hitachi, on the other hand, is working on further advances in BiCMOS technology suitable for SRAM use, as well as in an area known as "pseudo-SRAMs." Like a chocolate covered cherry, pseudo-SRAMs have DRAM cells at the core of the chip, with SRAMs on the periphery, says Dan Pichulo, Hitachi's department manager for SRAMs, EPROMs and EEPROMs. Micron recently annouced its own version of pseudo-SRAMs.

"Pseudo-SRAMs"

On the price side of the equation, the SRAM market was overburdened with supplies by the end of last summer and prices were on the decline even for high-speed parts, Ford says. But the downward price spiral may be stabilizing under the influence of microprocessor development, in such areas as the Mips processor family that requires very fast timing, which could stimulate demand at the below 12 nanosecond range, he says.

"High performance SRAMs aren't likely to freefall; they're harder to produce," Ford says. "There's no such thing as a protected niche. You can't depend on being able to hide in the niche. If a lot of manufacturers muscle in, prices can collapse and drive you out of what was a nice business." □

Veteran SRAM maker looks ahead

Larry Jordan, vice president of marketing for Integrated Device Technology Inc., believes that the growing importance of RISC microprocessors is the key to understanding today's business conditions in the SRAM market. IDT, founded in 1980, has been very successful in the fast SRAM business. The Santa Clara, Calif.-based company had net income of $17 million on revenue of $209 million, for fiscal 1990, ended April 1.

The development of RISC microprocessors has forced companies to look for ways to make memory match the speed of the CPUs, Jordan says. Where CISC microprocessors allowed more time for memory access, RISC microprocessors demand constant, nearly instantaneous access because of their less complex and thus faster instruction cycle.

IDT is working closely with Mips Computer Systems Inc. as one of that company's chip partners, and sees embedded applications as the next step in the development of even greater chip sales for IDT, Jordan says. IDT also is working with Intel Corp.; it developed a cache RAM for Intel last year and the two continue to work on further developments, he says.

BiCMOS work is also big at IDT — in the expectation that the technology will follow the same development and acceptance pattern that CMOS did. A major project is the development of a BiCMOS version of the Mips microprocessor, Jordan says.

"The world is changing," adds Jordan. "Memory doesn't stand alone. You can't independently define memory requirements, you have to work very closely with customers. The process is very precise." A one-nanosecond delay in the memory chip's response can waste a 30-nanosecond microprocessor clock cycle, he says.

Jordan says the fast SRAM market offers plenty of potential for growth.

"The slower SRAM market has been dominated by the Japanese since the late '70s. That's not going to change," he says. "But fast SRAMs are going to grow by a factor of five in the next three or four years. They're needed for performance enhancement of microprocessors rather than raw storage." □

Smaller drives aim to satisfy needs of workstation market

With once-reluctant workstation vendors now calling for high-capacity, high-performance 3.5-inch devices, drive manufacturers are only too happy to comply

BY GIUSEPPE LABIANCA

Jim Watson's declaration that Scottish hard disk drive maker Rodime Inc. "has decided to refocus itself on the fast-growing high-capacity, high-performance 3.5-inch market" is not very unique at all. The Rodime sales and marketing vice president is actually echoing the sentiments of most drive manufacturers these days who are also targeting the growing OEM workstation market with the smaller form factor drives.

Desktop workstations are moving from 5.25-inch magnetic hard disk drives to 3.5-inch hard drives, while high-end workstations will be making the move from 8-inch hard drives to 5.25-inch hard drives.

"The high-capacity 3.5-inch drive market is probably the hottest growth segment that Dataquest covers," according to Phil Devin, senior analyst at Dataquest Inc. in San Jose. Devin expects unit shipments of 3.5-inch drives in the 200- to 500-megabyte range to explode from 366,000 units in 1990 to five million units in 1994.

The advantages of the small hard drives are numerous. Manufacturers can pack more than one drive onto a desktop machine. Power requirements are reduced, so the drive units run cooler and quieter. Small drives are easier to assemble into arrays, and, because the magnetic disk is itself smaller in diameter, it is more rigid, making it less susceptible to head crashes.

These tiny mega-drives also are beginning to offer more attractive pricing. "If you look at the cost per megabyte with a controller, the crossover point has been reached between the 3.5- and 5.25-inch drives," says Bill Carson, mass storage and peripherals marketing manager for Hewlett-Packard Co.'s Apollo workstation division.

Shipments of 3.5-inch magnetic hard disk drives surpassed those of 5.25-inch drives in three short years, thanks mostly to a strong need for smaller drives in personal computers. But workstation makers have been slow to date to incorporate them into their machines, despite the many advantages. "The higher performance and capacity which has been needed in many of these markets was just not there yet. But the technology is there now," says John Gannon, marketing manager for HP's disk mechanism division.

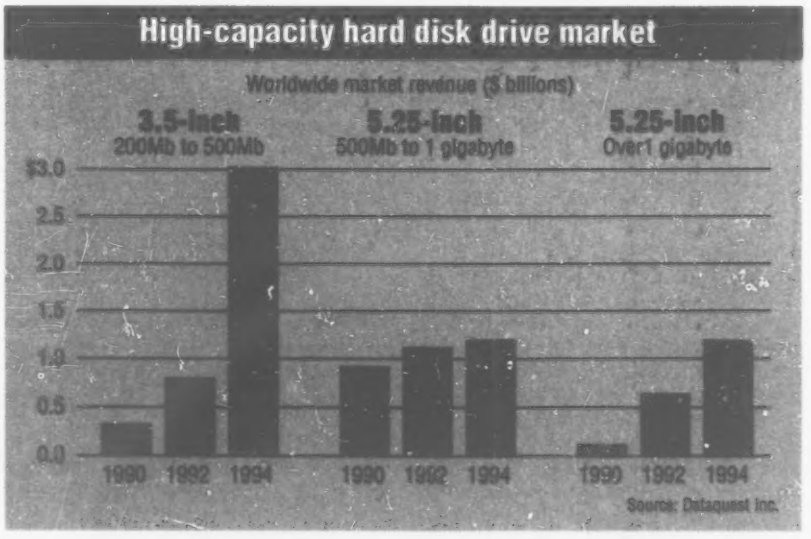
Increasing capacity

The highest capacity 3.5-inch drives now shipping are in the mid-300-MB range, with most in the 200-MB range. But that should increase to nearly 500 MB by the end of this year, according to James N. Porter, president of Disk/Trend Inc., a Mountain View, Calif., disk-drive market research firm. HP recently announced it would be entering the 3.5-inch market with a 420 MB drive. Several other manufacturers are expected to announce drives with similar capacities by early this summer.

Robert Katsive, a Disk/Trend analyst, sees 3.5-inch drive capacity reaching the 1-gigabyte range, with shipments totaling 350,000 units by 1992. Industry executives agree that a 1-GB 3.5-inch drive may be on the market by 1992, but they are skeptical it will be in volume production by then.

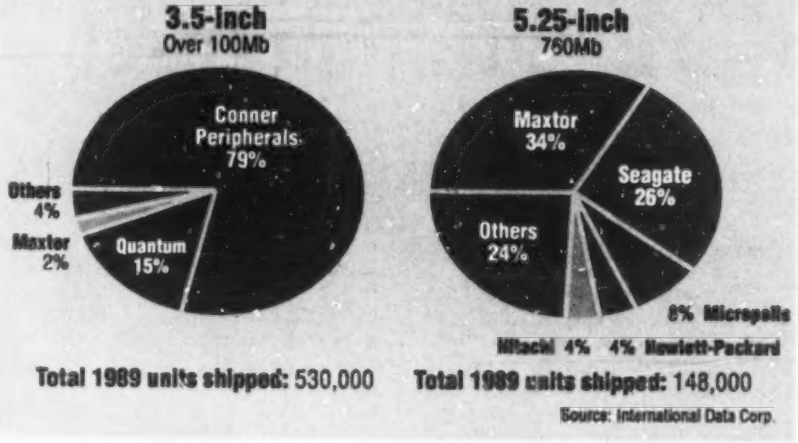
Four drive makers — Conner Peripherals Inc., Quantum Corp., Maxtor Corp., and Rodime Inc. — are leading the onslaught to the 3.5-inch merchant OEM market.

Conner had a 79% share of the market last year for 3.5-inch drives above 100 MB, shipping 417,000 units, according to International Data Corp. Approximately 17% of its sales are to the desktop workstation



Leaders in the high-capacity hard disk drive market

Percentage of worldwide units shipped, calendar year ending 1989



market, according to Howard Wing, director of marketing. Conner's 100-MB and 210-MB drives are aimed at the desktop workstation market.

Maxtor is currently shipping the highest capacity 3.5-inch drive for the OEM market, a 340-MB product. Maxtor's recent purchase of troubled MiniScribe Corp., makes it the second-largest disk-drive maker behind Seagate Technology Inc., which acquired Imprimis Technology Inc. last year from Control Data Corp. Maxtor, the only major player in high-capacity 3.5-inch arena that is still involved in 5.25-inch, had a 34% share last year in the 760-MB 5.25-inch market. Seagate also accounted for 26% of the 148,000 units shipped, according to International Data Corp.

Quantum was once a player in the 5.25-inch market, but it allowed its products to mature as it moved to the smaller form factor, according to John Klonick, manager of product marketing. Quantum sustained losses of more than $3 million in 1988 because of the glut of 5.25-inch drives on the market. The company decided to drop the 5.25-inch drive altogether and go after the burgeoning 3.5-inch market exclusively. Klonick says Quantum is now targeting the workstation market with higher capacity 3.5-inch drives, scheduled to be announced early this summer.

Rodime, suffering through some recent hard times, sold off its Rodime Systems Division that targeted the reseller channel, and is now targeting the OEM workstation market, Watson says. That strategy may be paying early dividends, as Rodime was awarded a contract in February by HP's Apollo workstation division to produce disk drives for its Series 2500 workstation, Rodime's first design win into a workstation.

Forced to increase capacity because of pressure from rising 3.5-inch capacities, the leading 5.25-inch makers (Maxtor, Seagate and Micropolis Corp.) are setting their sights on the high-end of the workstation market.

These tiny mega-drives also are beginning to offer more attractive pricing

This strategy is especially evident at Micropolis, the only major disk-drive manufacturer not in the 3.5-inch market. Micropolis has taken a beating in the marketplace, sustaining losses of more than $70 million in the last two years. "As part of our return to profitability plan, we suspended work on our 3.5-inch product last year," says Chet Baffa, senior vice president of marketing and sales. Instead, Micropolis' strategy has been to focus on the high-end workstation market and mainframe market with high-capacity 5.25-inch disk drives.

Shipments of high-capacity 5.25-inch drives are expected to increase greatly over the next two years. According to Disk/Trend, 90,000 5.25-inch drives with capacities over 1 GB will be shipped in 1990, with shipments exploding to 750,000 by 1992. However, Dataquest sees shipments only going to 340,000 by 1992, still a very healthy growth.

Although growth will be good for high-capacity 5.25-inch drives over the next few years, Baffa admits that he foresees problems with not having a 3.5-inch drive: "Focusing on the high-end 5.25-inch market is not a forever strategy. That strategy will run out of gas. At some point, you're going to need to be in the 3.5-inch market."

Shipments of the lower-capacity 5.25-inch drives in the 500-MB to 1-GB range will increase from 512,000 in 1990 to 860,000 in 1994, according to Dataquest. But the dollar value of the drives will rise only from $922 million to $1.2 billion over the same time frame because of a drop in price.

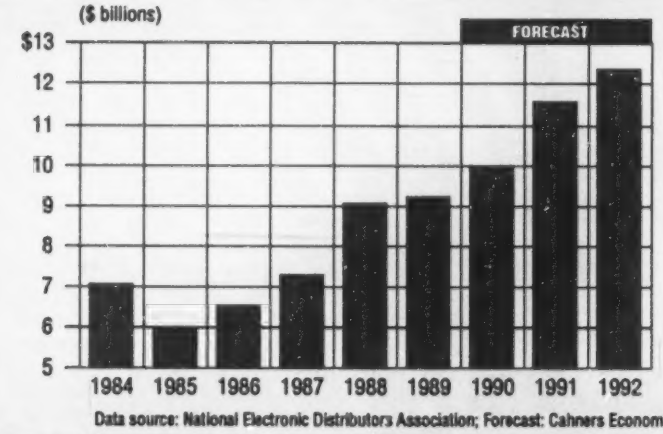
What's in store?

A number of workstation makers have already begun evaluating 2.5-inch drives for possible future use in desktop workstations. Many of the companies that are involved in the 3.5-inch drive market are also working on these even smaller drives, according to industry executives. But capacities are still relatively low for the 2.5-inch drives. Conner and Prairie Technology Inc. make 2.5-inch drives with capacities in the 20- to 40-MB range.

Areal Technology Inc., a small San Jose drive company, recently announced a low-profile 100MB 2.5-inch drive that it hopes to begin shipping by the end of the year. Mike Kirby, vice president of marketing and sales, says, "We built these drives mainly for portable laptops and notebooks. It really didn't dawn on us that workstation makers would be interested in them, but they have shown some interest."

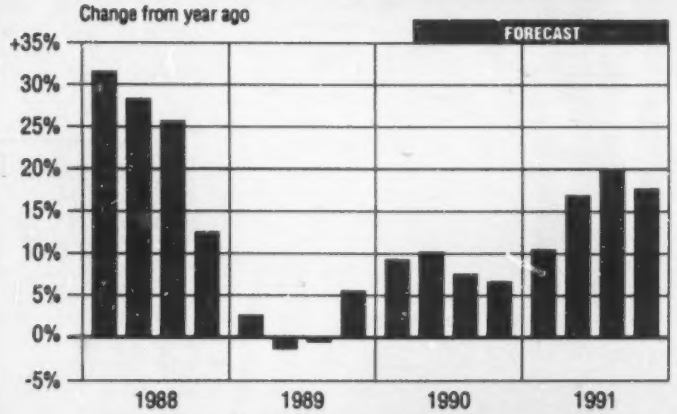
HP's Carson, predicts that the 2.5-inch drives will follow "the very same kind of curve, in terms of capacity improvement, in about the same time period as did the 5.25-and 3.5-inch drives." □

Electronic distributors' shipments



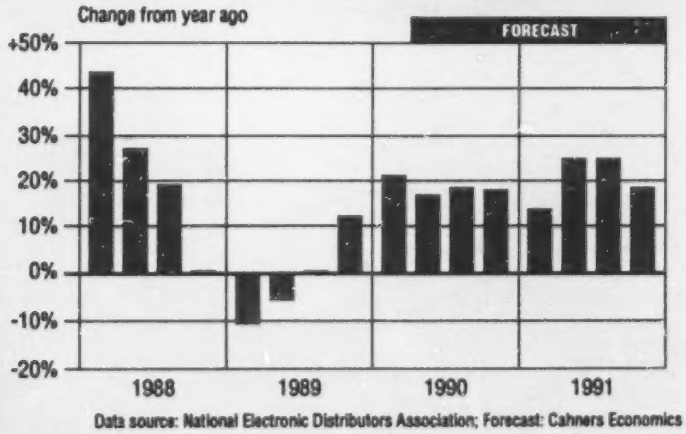
Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributors' shipments growth



Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributors' orders growth



Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributor orders and shipments surge, again

Any lingering suspicion that the electronics industry is due for a recession this year has been laid to rest by distributors. The nation's largest electronics distributors report orders surged by 22% in the first quarter of 1990 compared to year-ago levels. According to a National Electronic Distributors Association survey, orders in March stood at record-breaking levels.

Of course, distributor orders do have a way of getting inflated rapidly when supplies are tight. Under these conditions, double-or triple-orders from buyers cause the distribution data to be a less-than-reliable indicator. No doubt, there now exists some supply-demand imbalances in the electronics purchasing chain for specific types of devices. Overall, however, buyers are saying that delivery times for components remain relatively short now. So the orders run-up cannot be entirely explained by tight supply conditions.

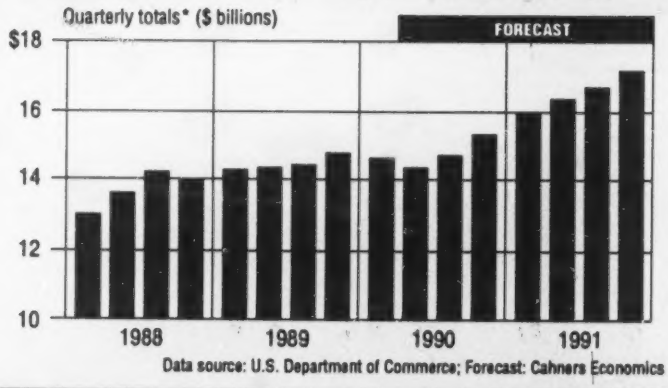
Most encouraging is that shipments are up, too. Compared to a year ago, distributors' shipments rose 9.5% in the first three months of this year. The business cycle turnaround in distribution has clearly passed a critical low point and growth is on a cyclical upsurge now.

These gains are a bit unexpected to this forecaster. The rebound has started about six months sooner than first predicted. Three months ago, the forecast reported in this column called for just under 3% growth in distributor shipments. Now, with first-quarter gains so solid, annual shipments' growth for 1990 has been revised upward to 8.6%. This upward revision means that the forecast for 1991 shipments growth has been revised down from 21% to 17%. The unexpected gains this year will steal a bit of growth from next year.

Distributors, and subsequently manufacturers, may find this year's gains no less mysterious than last year's slowdown. The trend for the remaining quarters of 1990 may well be two steps forward, one step backward. Not until 1991 should we expect sales for distributors and manufacturers to be advancing in tandem without any backsliding. Keep your perspective: Only a year ago lots of forecasters were talking about the ever-present danger of recession. Distribution data now clearly point to growth ahead.

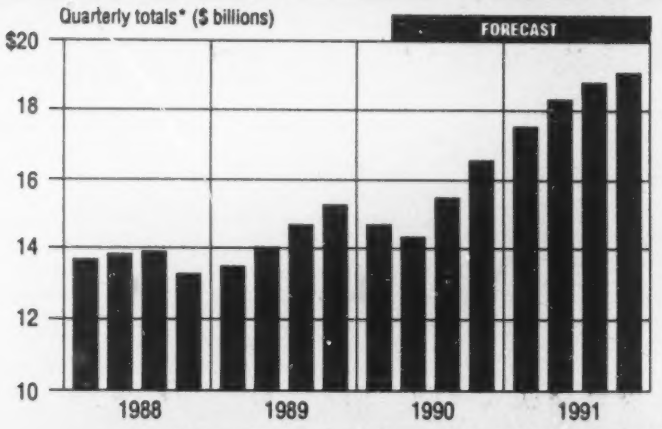
ELIZABETH B. BAATZ, Cahners Economics

Electronic components shipments



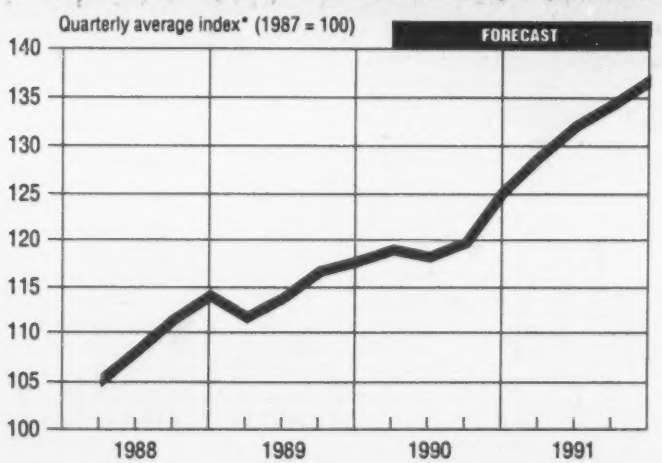
Data source: U.S. Department of Commerce; Forecast: Cahners Economics

Electronic components new orders



Data source: U.S. Department of Commerce; Forecast: Cahners Economics

Electronic components industrial production



* Seasonally adjusted

Data source: Federal Reserve Board; Forecast: Cahners Economics

Components industry strengthening

Contrary to expectations, the U.S. components industry showed several signs of strength in early 1990. Components production in the United States grew 6.4% in the first three months of 1990 compared to a year ago, the strongest such gain in over a year. What's more, U.S. component makers are now producing at record-breaking levels and component orders are starting to trend upward.

But yellow flags are still evident. Compared to the previous quarter, electronics components shipments and orders slowed in the first quarter of 1990 and will slow again this quarter. However, the slowdown will most likely be mild and short-lived.

The reason for the upbeat forecast is buoyant backlogs. According to the Department of Commerce, backlogs at component factories in the United States rose this past March compared to March, 1989, for the first time in 14 months. This turnaround in backlogs growth means factories will have a buffer with which to withstand the temporary orders slowdown.

Because of the signs of strength, Cahners Economics' forecast for electronic components production has been raised to 4.7% growth in 1990, about on par with the 4.6% gain registered in 1989. So, instead of a slight decline in output this year as originally expected, the industry should weather the general economic slowdown of 1990 well.

All this points to a long-term trend that will be shaping the component industry throughout the next decade. Instead of wild gyrations in growth rates as in the past, growth during the coming decade will be steadier. The reasons: better inventory control and more exporting and importing as trade barriers fall. Both of these factors point to a weakening of the business cycle, which will take some of the boom out of business expansions and the bust out of contractions.

ELIZABETH B. BAATZ, Cahners Economics

For more information about Cahners Economics' electronics industry forecasts and track records, write Dan Buchan, Cahners Economics, 275 Washington Street, Newton, Mass. 02158-1630. Telephone: (617) 558-4758; fax: (617) 558-4402.